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DRAFT TECHNICAL REPORT NO. 2

PHASE 2 STAGE 2C
SELECTION OF PREFERRED SITE

BIOPHYSICAL ASSESSMENT

BIRD AND HALE LIMITED

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

HALTON

ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT OF SOLID WASTE MANAGEMENT

JANUARY 1986

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SUMMARY

The vegetation, wildlife habitat, and biological aquatic systems characteristics of six candidate sites were investigated and evaluated to help define the landfill Site Plan Areas within the candidate sites. The biophysical characteristics of the Site Plan Areas were then evaluated and compared to determine, from a biophysical perspective, the most suitable site(s) for landfilling.

The biophysical characteristics of the sites were determined through review of information acquired in earlier phases of the Environmental Assessment, airphoto interpretation, on-site investigations, and discussions with Ministry of Natural Resources and Halton Region Conservation Authority staff. The implications of a landfill on each of the sites were categorized and analyzed with regard to vegetation community types, plant species types, wildlife habitat characteristics, and biological aquatic systems characteristics.

Adverse biophysical environmental changes that may occur as a result of a landfill on the sites were rated as O - no significant impacts; L - low impacts; M - moderate impacts; and H - high impacts. These ratings were assessed and discussed to establish a priority listing of the Site Plan Areas, in order of relative biophysical suitability to support a landfill operation.

Site Plan Areas A, C, and D offer the least biological constraints to the location of a landfill. The constraint on Site Plan Area A relates to future potential downstream water quality deterioration. However, the possibility also exists for control of the sedimentation that now occurs. The constraint on both Site Plan Area C and Site Plan Area D relates to the loss of portions of woodlot communities that have some biological value in terms of plant species present and wildlife habitat capabilities.

Site Plan Areas B and E are somewhat less suitable. On Site Plan Area B, the main constraint relates to the loss of a relatively large woodlot that is the least disturbed of the woodlots investigated in this study. On Site Plan Area E, it would be necessary to clear the southern portion of a woodlot complex that extends north beyond the site boundary and there is a possibility that this woodlot complex provides habitat for the West Virginia White Butterfly.

Site Plan Area F, with the presence of three rare plant species and a diversity of vegetation community types, is the least suitable site from the perspective of the biophysical characteristics. However, this rating is only valid if shale quarrying does not occur on the site (and there is an existing extractive licence). That activity would substantially lower the biophysical significance of the site.

In summary, with regard to biophysical characteristics only, the Site Plan Areas can be listed in order of relative suitability to support a landfill operation, as follows:

More suitable ---------- Less suitable

A > D > C > B, E > F

It should be stressed, in addition, that the differences in suitability among Site Plan Areas D, C, B, and E are minor.

1.0 INTRODUCTION

The Stage 2C biophysical investigation of the six candidate sites verified and augmented the vegetation, wildlife habitat, biological aquatic systems characteristics that had been determined in previous phases of this study. The aim of the investigation was to ascertain in detail the biological constraints to the development of a landfill that each of the sites may exhibit. This information helped define Site Plan Areas within the Candidate Sites. The Site Plan Areas were then evaluated to determine which one(s) could support a landfill and result in the least biological environmental impact.

2.0 STUDY METHOD

To meet the aims of the study, the techniques employed included:

- Airphoto interpretation;
- On-site investigations;
- Meetings with MNR and HRCA representatives; and
- Review and integration of previously available information.

The vegetation communities on each Candidate Site were mapped and examined in detail in the field so that the type, extent, relative health, disturbance history, and naturalness of the various community types (e.g., forest, scrub, meadow, etc.) could be determined. The potential of forested areas to become managed woodlots was considered in terms of the cohesiveness of the forest unit, and the tree species present and their age distribution. MNR forestry personnel were consulted. Plant species identification in the woodlots was also undertaken and the status (e.g., rare, significant) of the plants was assessed. The species lists which resulted are from a single season (summer) inventory and additions to the list may occur if multi-season inventories were conducted. In addition, the vegetation community characteristics were used to ascertain the wildlife habitat capabilities of the candidate sites. Sightings and signs (e.g., browse marks, droppings, etc.) of animal species were noted during the site visits but no specific wildlife inventories were undertaken. The role that a site may play in a movement corridor for wildlife also was assessed, based on the shelter that a site affords animals, the continuity of the shelter across the site, and the habitat potential of areas adjacent to a site that may encourage animals to migrate through the site. Drainage channels on, and influenced by, the candidate sites were examined to determine their biological function and required set-backs, or biologically acceptable modifications to the drainage pattern.

Sufficient data were obtained to permit an evaluation and comparison of the opportunities and constraints that the biophysical conditions of each Candidate Site exhibit for a municipal landfill. The evaluation sub-factors, and the measures by which these sub-factors are assessed on each site, are

explained below. These sub-factors and measures have been established with consideration to the conditions and features that likely would be encountered, based on Stage 2B information. The same sub-factors have been examined in Stage 2C as in Stage 2B; however, the information was obtained and analyzed in greater detail.

2.1 Sub-Factor - Vegetation Community Types

Measures

a) Uncommon Communities - preserve atypical/rare, stable, natural communities;

b) Important Communities - conserve as much as possible of non-field communities, for wildlife habitat, soil maintenance and erosion control, aesthetics, and buffers.

c) Managed Woodlots - conserve areas that are, or have potential to be, managed as productive woodlots.

Where:

- Atypical/rare communities are considered more significant than typical/common communities.
- Stability is the ability of a biological community to sustain itself, and relates to on-site size, continuity off-site, age, and regeneration capabilities.
- Naturalness relates to the existing level of man-induced disturbance within the community.

2.2 Sub-Factor - Plant Species Types

Measures

a) Rare Species - preserve rare plant species.

2.3 Sub-Factor - Wildlife Habitat

Measures

a) Habitat - preserve habitat of locally present rare or endangered species; preserve significant habitats of other species.

b) Corridors - protect movement corridors.

2.4 Sub-Factor - Aquatic Systems

Measures

a) Drainage Pattern - preserve existing drainage pattern of permanent flowing channels.

b) Water Resource Characteristics - prevent downstream adverse modifications in water quality, quantity, and sediment load.

After the Candidate Sites were investigated, they were analyzed to ascertain which one(s), or portion of one, best fulfilled the natural environment criterion of minimum environmental impact. On some of the Candidate Sites, there are areas and biophysical features that are of greater significance than other areas on the same Candidate Sites. Information concerning these areas and features was used to help delineate the Site Plan Areas. The boundary of each Site Plan Area is shown Maps 1, 2 and 3.

To compare the Site Plan Areas in terms of suitability to support a landfill, for each site, significant points have been extracted from the resource data and placed in an Evaluation Chart. The column headings for the Charts are as follows:

Evaluation sub-factors - This column lists the evaluation measures for each of the sub-factors, as discussed above. Noteworthy points are mentioned in subsequent columns.

Prevailing Condition and/or Anticipated Change - Any significant characteristics of a biophysical feature (sub-factor) or natural change that is expected to occur in that feature even without the presence of a landfill site, is noted so that the consequences of a landfill site can be understood better. Changes that may occur as a result of man-related activities (e.g., clearing for development) are not generally considered; however, comments are made concerning planning designations that may lead to significant changes.

Potential Impact from Landfill - All positive and negative impacts of a landfill, with regard to each evaluation factor, are catalogued in this column.

Significance of Impact - Comments are made concerning the significance of the impacts, based on the extent and permanency of any modifications.

Mitigating Measures - Any reasonable action that would, if implemented, eliminate or reduce a negative impact is outlined here.

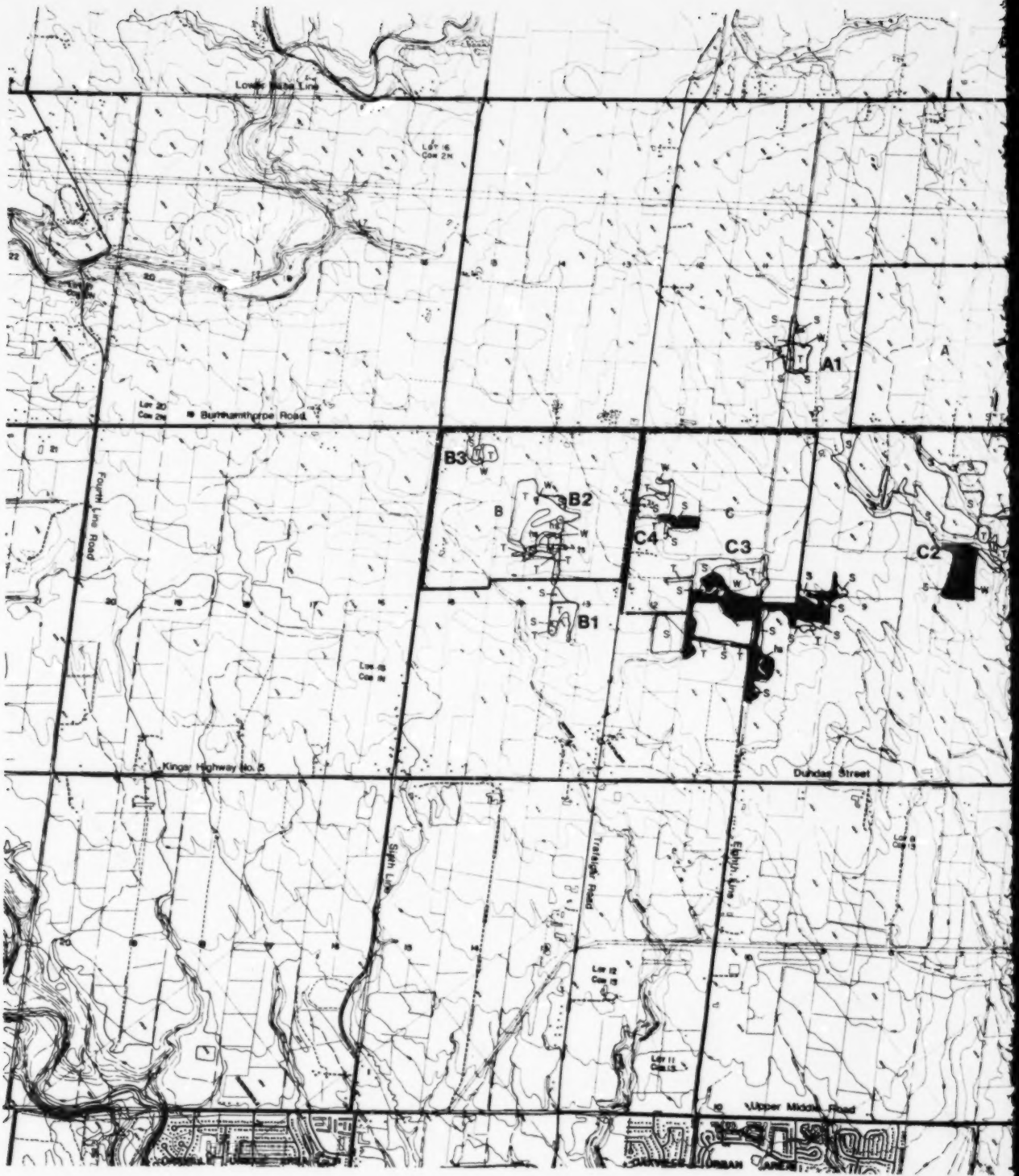
Residual Impact - Those negative impacts that cannot be eliminated are outlined in this column.

Significance of Residual Impacts - Comments are made concerning the significance of the residual impacts, based on the extent and permanency of any modifications.

Rating - The residual impact with regard to each measure of each sub-factor is rated according to the following scheme:

0 - Measure does not apply or there are no significant impacts.
L - Low impacts remain.
M - Moderate impacts remain.
H - High impacts remain.

The ratings are then used to compare the Site Plan Areas in terms of preference (least impact) to support a landfill operation. This comparison is based solely on the natural environment and is descriptive rather than numerical in nature. That is, for instance, the significance of two-H ratings vs. five-L ratings is considered and discussed in terms of the significance of the sub-factors and measures themselves, rather than the ratings being added to give a "total" rating.


Lower Base Line
Burnhamthorpe Road
Fourth Line Road
Kingsway Highway No. 5
Dundas Street
Sixth Line
Trafalgar Road
Eighth Line
Upper Middle Road
A
A1
B
B1
B2
B3
C2
C3
C4

MAP 1

LEGEND

NATURAL ENVIRONMENT

- T Treed
- S Scrub
- W Wet,Graminoid
- M Meadow
- hs Hardwood Swamp
- ts Thicket Swamp
- Site Plan Area
- A1, B1, B2, etc. - Identifies Woodlots for Text Reference.

Map Information Compiled By:
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SELECTION OF PREFERRED SITE

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Derry Road
HILTON
E2
E
E1
Britannia Road
Bell School Line
Trafalgar Road
Canadian National Railways
First Line
D3
D2
D
D1
Upper Base Line

MAP 2

LEGEND

NATURAL ENVIRONMENT

- T Treed
- S Scrub
- W Wet,Graminoid
- M Meadow
- hs Hardwood Swamp
- ts Thicket Swamp
- Site Plan Area

A1, B1, B2, etc. - Identifies Woodlots for Text Reference.

Map Information Compiled By:
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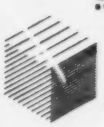
SELECTION OF PREFERRED SITE

ENVIRONMENTAL ASSESSMENT OF THE LANDFILL COMPONENT OF HALTON'S SOLID WASTE MANAGEMENT SYSTEM



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MAP

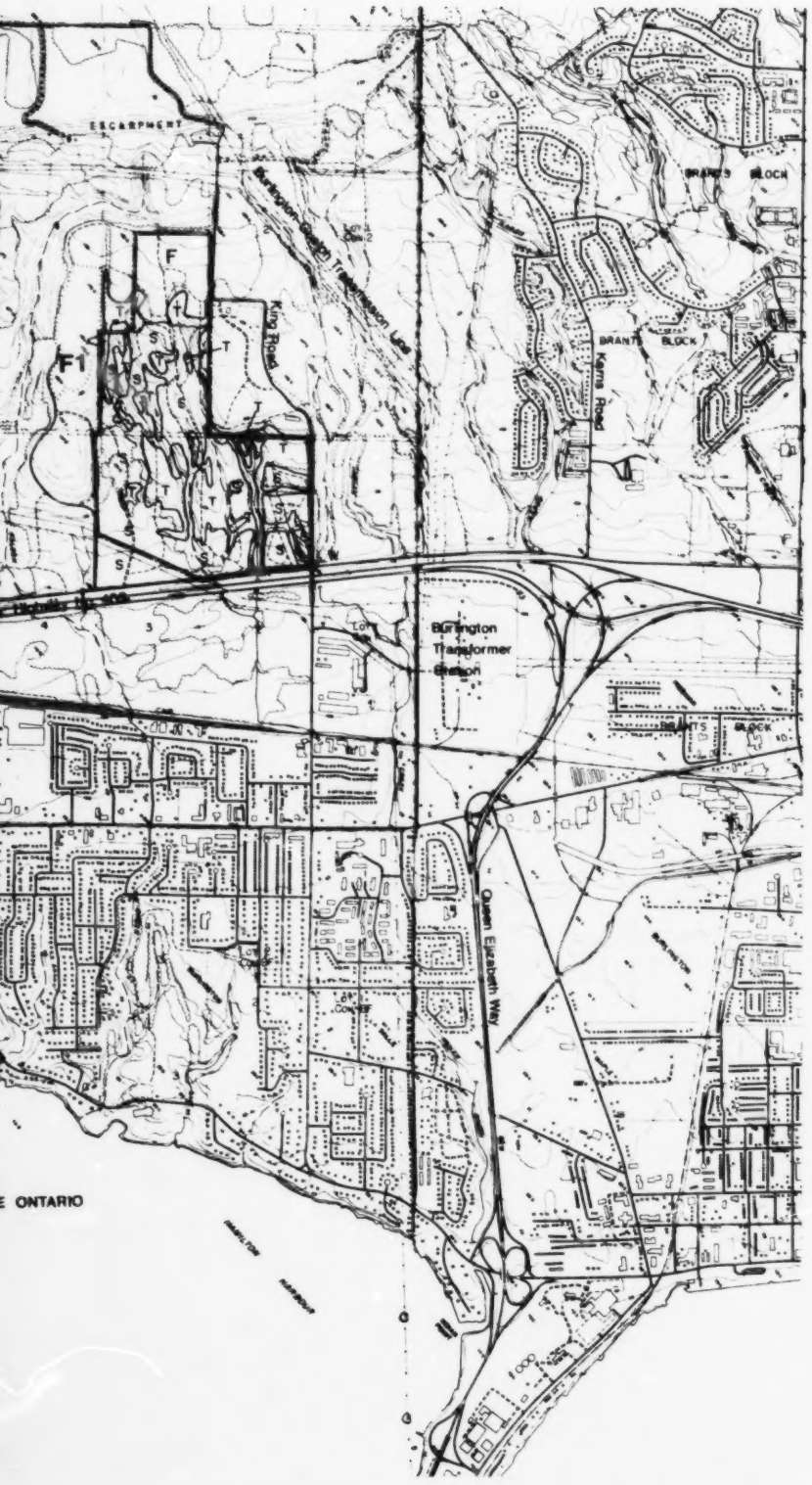
LEGEND

NATURA

T Treed
S Scrub
W Wet,G
M Meadc
hs Hardw
rs Thicke
Site P
A1,B1

PHASE
SELEC

ENVIRO
LANDFIL
SOLID W



MAP 3

LEGEND

NATURAL ENVIRONMENT

- T Treed
- S Scrub
- W Wet,Graminoid
- M Meadow
- hs Hardwood Swamp
- ts Thicket Swamp
- Site Plan Area
  A1,B1,B2, etc. - Identifies Woodlots for Text Reference.

Map Information Compiled By:
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PHASE 2, STAGE 2C
SELECTION OF PREFERRED SITE

ENVIRONMENTAL ASSESSMENT OF THE LANDFILL COMPONENT OF HALTON'S SOLID WASTE MANAGEMENT SYSTEM

Scale

0 50 100 200 400 600 1000 m

N

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3.0 CANDIDATE SITE INVENTORIES AND ANALYSIS

3.1 General

The following discussion addresses the Candidate Sites as they were defined at the outset of Stage 2C. Portions of the Candidate Sites that are excluded from the Site Plan Areas are mentioned. The individual biophysical communities on a site are referred to as "woodlots" and are prefixed with the site letter (e.g., "C"), and then given a number (e.g., 4) to identify that community on the accompanying map (e.g., C4). The maps also show the locations of the various community types (e.g., forest, old field, wetland) within the various "woodlots". Surrounding land within the candidate site boundaries that is not mapped is cleared farmland. A general description of the mapped cover types follows:

. Treed

In these areas, canopy closure by trees is greater than 70%.

. Scrub

Trees typically comprise less than 30% of the canopy. These areas include early stage old field communities and successional thickets, often dominated by hawthorns, occurring intermixed with and along the edges of treed areas, on slopes, and ravine bottoms.

. Meadow

These are dry, herbaceous areas which are in transition from maintained agricultural land to areas dominated by shrubs ("Scrub").

. Wet, Graminoid

These are lowlying areas which are permanently wet and exhibit wet meadow or marsh conditions, dominated by cattails, sedges, and rushes.

. Swamp

These are wooded wetland areas where standing to gently flowing waters occur seasonally or persist on the surface for long periods. "Thicket" swamps are dominated by shrubs, and "Hardwood" swamps are dominated by trees.

Appendix A lists the species identified in each 'woodlot' on each Candidate Site, with the exception of those woodlots for which access permission was not granted (see Table 1). For those woodlots (i.e., the ones for which detailed botanical inventories were not prepared), the species which were noted from a distance are discussed in the text.

3.2 Site A

This Site is almost entirely cleared farmland. As shown on the accompanying map, there is only one small woodlot (see Table 1 for size), in the central portion of the site. This woodlot was not examined in detail since access permission was denied. A visual examination from the southwest corner indicated that it is dominated by shagbark hickory (85%-90%). No unusually large trees are evident; most of the stand appears to support trees with 6-12 cm diameter, especially in the interior. The larger trees (20-25 cm diameter) occur along the edge. There is little understorey growth, although there are scattered hawthorns near the edge. The herb layer appears relatively dense; goldenrod, orchard grass and similar old field species occur near the edge. It does not appear that the woodlot is being actively managed; however, local use of the shagbark hickory wood has been reported. This woodlot is situated outside the final site boundary and, therefore, would not be adversely affected.

The site lies within the drainage basin of Joshua Creek. There are numerous locations along the southern boundary where water is directed

TABLE 1.

Woodlots on candidate landfill sites
in the Regional Municipality of Halton.
Sites are designated "A" through "F".

Woodlot Designation	Examined	Approximate Area (ha)
A1	No*	1.1
B1	Yes	1.3
B2	Yes	10.0
B3	Yes	1.1
C1	Yes	1.1
C2	No*	4.0
C3	Yes	6.1
C4	No*	0.6
D1	Yes	6.4
D2	Yes	2.0
D3	Yes	3.7
E1	Yes	15.5
E2	Yes	16.5
F1	Yes	48.0
F2	Yes	22.8

*Permission to examine the woodlot was not granted.

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south. Most of the flow occurs in phantom drainage channels[1] or through channelized ditches that receive farm field runoff. Where what appears to be the main channel of Joshua Creek crosses Burnhamthorpe Road, there are some trees and old field plant species; and, along the most easterly channel, a very small area of wet meadow-marsh conditions occurs. Otherwise, farm field conditions dominate. None of the channels support permanent flowing water and therefore they do not have an important aquatic habitat function.

In general, the site does not provide significant wildlife habitat. Urbanized mammals (raccoons, etc.) and deer, as well as various birds may make use of the site but significant shelter is not provided.

3.3 Site B

There are three areas on this site, which is mainly cleared agricultural land, that have been classified as woodlots (see accompanying map). However, B1 and B3 are quite small, dominated by "edge" vegetation community conditions (shrubs, herbs) with very little interior. The approximate sizes of the woodlots are given in Table 1. These woodlots are primarily deciduous, but numerous white pine are present, especially along the eastern edge of B2. Much of B1, especially the eastern section is presently shrubland which is in the process of regenerating to tree cover. It is very open. B3 is a very dissected woodlot, divided by fences among four landowners. Much of the southern half of the east section is swampy. Three trails dissect the north section of the woodlot. It is very disturbed with little undergrowth. B2 is divided by a north-south running wire fence into an east section (5.8 ha) and a west section (4.2 ha). A lowlying, wet, ponded area occurs in the north near the boundary of these

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1 Phantom drainage channels are frequently not noticeable on the ground because they are such shallow, gentle depressions. Because of subsurface moisture that may be present in the depressions, tonal differences on airphotos highlight this type of drainage system.

halves. Although both sections appear generally similar, the west section has a more uniform canopy and appears more even-aged and less disturbed. Much of the southern half of the east section is swampy. There is a trail running down the east side of the east portion. None of these woodlots are currently being actively managed, although B2 may have some potential in this regard, since it is a relatively large, healthy, cohesive unit. It is, however, under the ownership of more than one landowner.

The plant species identified in these woodlots are listed in Appendix A. None of the species are provincially rare.

The site is part of the headwater area of the Morrison Creek drainage basin. The main channel of the headwater creek rises in the west-central portion of the site. At the times of the site visits (June-July, 1984), the northern portion, approximately 20 cm wide by 5 cm deep, was totally dry. Further south, the channel widens out into a swale which was moist and supports sedges. Just north of where Morrison Creek exists, the property at the southern end of Site B, there is a small amount of water present but no flow. Because of its intermittent nature, the portion of Morrison Creek on Site B is not an important aquatic habitat.

This creek bed does appear to function as a wildlife corridor, providing a transportation route from the more natural, wooded areas to the northwest (East Sixteen Mile Creek area). Numerous deer and raccoon tracks were present in the channel bed and there appeared to be small burrows in the sides of the channel near the south end, perhaps for muskrat. None of these species are that uncommon in the Halton Region.

The site plan area encompasses B2 and B3 woods, and only the very top portion of the Morrison Creek channel.

3.4 Site C

The majority of Site C has been cleared, and much of it remains as farmland although some areas, especially the banks and bottomlands of the

floodplains of the channels of Joshua Creek are regenerating back to trees and shrubs. In addition, four woodlot complexes have been identified, as shown on the Map 1. Access permission was not granted for two of the woodlots (C2, C4) but, based on casual observations, it is not anticipated that they would differ markedly from the other woodlots in the area. C1 is not actually a woodlot, but there are several trees and shrubs growing on the slopes of a ravine through which one of the tributary channels of Joshua Creek flows. It exhibits previous extensive disturbance (clearing). It is similar in nature to all the wooded bank areas of the Joshua Creek tributary channels on this site. The bottomland is dominated by herbaceous flora (a small graminoid wetland; see accompanying map) while the woody vegetation stabilizes the slopes but extends very little beyond the toe of the slope and not at all above the rim. C3 is a series of wooded areas linked by relatively dense fencerows. The majority of it is upland deciduous, dominated by red oak and sugar maple and occupying the height of land in the immediate vicinity. The stand is relatively mature, with an open understorey. A wetland of approximately 2 ha is located in a lowlying area to the west of the upland stand. It is dominated by graminoids although shrubs and trees do occur. Drainage is to the north, where it connects with a tributary of Joshua Creek. None of the woodlots are currently being actively managed, although portions of C3 (and perhaps C2) may have some biophysical potential in this regard because of the size and health of the woodlots. C3, however, is owned by more than one landowner, which may limit its potential in this regard.

The plant species identified in the woodlots are listed in Appendix A. None of the species are provincially rare.

The majority of the site is within the drainage basin of Joshua Creek; however, a small section in the southwest drains into Morrison Creek, by flowing under Trafalgar Road. The northern half of the site is greatly dissected by five main channels of Joshua Creek, all of which are deeply incised. The more westerly channels appear as wide, deep swaled channels. The easterly ones have shrubs and trees within the floodplain. Water was present in scour ponds, and in the vicinity of the marsh area (north of C1)

but there was no continuous flow during the site visits. Further south, near the confluence of these tributaries (northeast of C2), the channel braids among islands (dominated by hawthorns) and supported standing water. However, the channel became dry again, until just upstream from where Joshua Creek flows south under Dundas Street. Therefore, because of its intermittent nature, the portions of Joshua Creek on Site C are not important aquatic habitat.

The Creek channels and the woodlots showed evidence of deer and raccoons, and numerous birds (e.g., barn and tree swallows, goldfinch, white breasted nuthatch, grackle, redwinged blackbird). The primary locations of movement of animals onto, and through, the site are the Creek channels. The Site Plan Area, which is in the northwest portion of Site C, does not interfere with the incised channels of Joshua Creek, and thus will not substantially affect wildlife. Woodlot C4 and the northwest portion of C3 are within the Site Plan Area and, therefore, animals in these areas will probably be displaced to the east, to the vicinity of the Creek channels.

3.5 Site D

There are three treed areas on this site that otherwise has been cleared for agriculture. D1 is a very open scattering of individual trees, primarily deciduous (oak, maple, ash, hawthorn) but with some white pine. D2 is a small deciduous woodlot that surrounds the exit location of a small channelized ditch that enters the property approximately 700 m to the north of this exit location. Lowland deciduous trees (willows) occur adjacent to the channel, otherwise upland hardwoods dominate (oaks, basswood). D3 is a poor quality, low species diversity woodlot. The stand is densest along Britannia Road, and opens up in the interior. None of the woodlots are currently being actively managed and there appears little potential to do so. D1 is dissected by scrub areas; D2 is very small; and desirable species (e.g., sugar maple, pines, etc.) are not dominant on D3.

The plant species identified in the woodlots are listed in Appendix A. None of the species are provincially rare.

The majority of the site is within the drainage basin of a tributary of Sixteen Mile Creek. A small channel which flows into this tributary runs south along the western edge of D3 woodlot and then east to the tributary. During the field investigation, standing water was present in the northern section of this channel. However, at the confluence of this channel and the tributary, at the time of the field investigation, the stream bed was dry even though there had been significant rainfall during the preceding week. Standing water was present in the tributary just south of Britannia Road and for approximately 20 m above where it flows under Highway 25, but there was not continuous flow. Therefore, because of its intermittent nature, this portion of this tributary of 16 Mile Creek is not an important aquatic habitat.

A few deer and raccoon tracks were noted in the bottom of the channels that run east of and south from D3. This area may function in a minor way as a movement corridor. In the vicinity, however, 16 Mile Creek, to the east of this site, east of Highway 25, would be the primary movement corridor. Moreover, the final Site Plan Area excludes this portion of the candidate site; consequently, the effect on wildlife of a landfill on this Site Plan Area would be minimal.

3.6 Site E

There are two non-agricultural areas on this site, both of which are complexes of forest and wetlands. The southern woodlot (E1) comprises a wide range of cover types. There is a dense hedgerow along the Britannia Road, with other small treed stands primarily around the edge and interspersed with various wetland (wet meadow, graminoid fen) and old field communities. Woodlot E2, to the north, is less diverse than E1 in terms of the different cover types represented there. Much of the central portion of the area is lowlying with frequent areas indicating recent surface ponding of water. There is more edge community in this woodlot. Much of the periphery is represented by scattered trees with meadow conditions underneath, or supports old field communities that are gradually extending into former agricultural fields that are no longer tended. In the interior, many parts of the

under-storey are dense with saplings. These woodlots are not being managed and there is little potential to do so as they are dissected by wetland areas.

The plant species identified in these woodlots are listed in Appendix A. None of the species are provincially rare.

The site lies within the drainage basin of a tributary of Indian Creek. Other than a natural section of this tributary at the southwestern tip of the site, the only drainage channels are ditches which direct the flow to the southeast and the southwest.

As on the other sites, numerous deer and raccoon tracks were encountered. Midland Painted Turtles were seen in the ditch that runs along Britannia Road. Numerous turkey vultures and downy woodpeckers were also seen while on the site. Candidate Site E is southeast of the Escarpment and the vultures probably fly over from there to hunt over the open fields. Animals may utilize the site as part of a movement corridor from the escarpment area to areas to the south. However, Derry Road and the ever-increasing level of development along that road, and the cleared farmland to the north of the candidate site limit the current and future potential of this site as a wildlife movement corridor. Those animals utilizing the site in this manner would probably be displaced to the west, and utilize the natural corridor afforded by Indian Creek (west of Bell School Line).

On May 25, 1984, there was an unconfirmed sighting of a West Virginia White Butterfly in the vicinity of E2 (pers. comm., Ministry of Natural Resources). This butterfly is currently classified as rare, and thus areas in which it breeds require protection. This butterfly is known to require Toothwort (Dentaria diphylla) plants in its habitat and this plant was not found on the site (see Appendix A). The reported sighting was late in the season for breeding for this butterfly and, if sighted, it may have been a stray. It is doubtful that this is important habitat for this species but investigation of E2 in April/May for the butterfly and Toothwort plants may be required to rule out the possibility. The Site Plan Area, however, only

protrudes into the very southern part of E2 (E2 is the northern woodlot on E). This part of E2 is primarily dry, supports "Scrub" and some "Treed" (see map), but not the main portion of the "Treed" or the "Hardwood Swamp" area, which would be the preferred locations for Toothwort.

E1, which is the southern woodlot is entirely excluded from the Site Plan Area.

3.7 Site F

This site has the largest area of wooded lands, the largest number of biological community types, and the largest number of provincially rare plant species of any of the candidate landfill sites. There are mature, upland hardwood stands, coniferous plantation (dominated by white pine), regenerating scrub, meadow, and marsh communities.

During this investigation, three provincially rare plants were identified (See Appendix A). Proctor and Redfern (1982) identified eight provincially rare plants at the time of their studies. Since the time of the Proctor and Redfern study, the classification of some of these plants has changed because of the addition of further records that indicate that the species are more prevalent than was previously believed (Argus and White, 1982, 1983, 1984). Seven of these eight species were also spotted during this investigation and, of these seven, only two, Carex gracilescens and Swertia caroliniensis (Frasera caroliniensis) remain on the rare species list. The other species, Juglans nigra is no longer classified as rare. Presently, three provincially rare species are known to occur on the property: Carex gracilescens, Spenopholis nitida, and Swertia caroliniensis. The sightings of these plants occurred in the southwestern third of the property.

In addition to examining the communities on this site, the northeastern portion of Halton ESA No. 4, Sassafras Woods, was also studied (F2). This section of the ESA is entirely wooded, follows the course of a small (permanent) stream, and consists of rather steep slopes of a sizable ra-

vine. It shares some of the characteristics of Site F, but also differs in a number of specifics. The soils of this area are less droughty than those of Site F, erosion is less evident, and the effects of human disturbance are less apparent. There are fewer habitat types here, and although several of the unusual plant species of Site F are present, only one of the provincially rare species is (Spenopholis nitida).

The numerous intermittent drainage channels which flow in the bottom of the eroded ravines of the site are part of the Indian Creek drainage basin. Only the channel in the most easterly ravine had flowing water at the times of the site visits. The marsh community occurs in this area. This channel is fed by springs that occur in the southern side-slope of the former Bayview landfill site. At the point of issue, the water is discoloured and has a noticeable odour. The channel is not considered important aquatic habitat.

Deer, raccoons, birds, and other animals tolerant of nearby, urbanized environment (e.g., rabbits, fox) frequent the site but the on-going high level of human activity on and around the site has reduced the habitat potential. The site is regularly used by dirt bikers. Currently, this is the main cause of reduced habitat potential since the times and locations of use of the site for this activity is variable, and since this activity results in physical disturbance to the biophysical terrain. Moreover, the long-term use of the site by animals may be further jeopardized by the existence of an extractive licence (shale quarry permit) for the site.

Movement of animals onto the site, especially from Sassafras Woods (ESA No. 4), no doubt occurs. These animals would be restricted in their movement to the site if a landfill were situated here. However, the use of the site as a corridor to areas to the south does not occur because of the Highway 403 complex. Therefore, large populations of animals would not be displaced in their movement.

An examination of Site F in terms of the nine selection criteria of Halton Region for Environmentally Sensitive Areas (ESA) indicates that there is potential for it to meet criteria 5 and 6, and perhaps 1, 3 and 4, as follows:

Criterion 1: ". . . distinctive and unusual landform . . ." The area, with its erosional features of ridges and ravines which expose the Queenston shale parent material, may meet this criterion. However, the significance of the area, since its character is the result of human as well as natural disturbance, and since other representations of this feature are evident in the Region, may not be sufficient to designate it for this criterion.

Criterion 3: ". . . communities of . . unusually high quality . . ." The upland hardwood tree stands in the undisturbed areas of the site may meet this criterion. Their small size may be a limiting factor in terms of their significance.

Criterion 4: ". . . habitat with limited representation . . . or a small remnant of particular habitats which have virtually disappeared . . ." In addition to the physical conditions responsible for the applicability of Criterion 5 (see below), the climatic regime also significantly influences the area. Its position between the Niagara Escarpment and Lake Ontario results in a more moderate climate that permits more southerly species to migrate into and persist in the southwestern part of Halton Region. The upland hardwood stands and the rare plant species that occur there may fulfill this criterion which normally applies "only to well-defined communities thought to occur in fewer than five locations throughout the Region".

Criterion 5: ". . . unusually high diversity of biological communities . . . due to a variety of geomorphological features . . ." The area has a range of physical conditions, from lowland wetlands with organic deposition, through minor slopes with residual clay soils, to droughty ridge tops. In conjunction with the microclimate (see 4 above), these conditions

result in a broad range of biological community types over very short distances. In addition, the conditions discussed under criteria 1 and 3 (above) could also be considered under this criterion, thereby strengthening the applicability of this criterion. The the small size of many of the communities and the dependence of some on the disturbance history of the site may reduce the significance of this criterion.

Criterion 6: ". . . habitat for rare or endangered species . . ." The presence of at least three provincially rare species means that the site definitely fulfills this criterion.

The accompanying map outlines the forested areas (as well as the other community types) which are important in terms of the rare species, and thus ESA Criterion 6, and to some extent Nos. 3 and 4. The intervening areas, the sideslopes and lowlands may be important with regard to No. 5, and perhaps No. 4. These latter criteria may be less significant since the site characteristics which apply depend to a certain extent on uncontrolled gravity and water erosion, human disturbance and creeks whose water quality is adversely affected by leachate from the former Bayview Landfill site.

In general, the long term significance of any portion of the site rests on it not being disturbed for any land use (e.g., quarry, industrial development, etc.) not just a landfill. Thus, the existing extractive licence and the current Parkway Belt planning designation on the site must be borne in mind during the biophysical evalution of this site for a landfill.

4.0 COMPARATIVE EVALUATION

Sites A, B, C, D, and E are lands of primarily agricultural use and rural housing. Where natural biophysical communities occur, they are often situated in lowlying, wet areas or along the banks of drainage channels. Site F, a shale deposit that was quarried in the past but is not currently being worked, is presently naturally revegetating except where eroding clay soils inhibit plant establishment.

The soil characteristics, history, and community size and composition distinguish the woodlots on and around Site F from those of the other five sites. Thus, the sites can be discussed as two groups, and compared where appropriate.

4.1 Sites A-E

These woodlots are, in most cases, on relatively poorly drained soils or are associated with seasonal wetlands or intermittent channels. The woodlots occur in a mosaic of agricultural fields and are likely to have had a longstanding and close association with agriculture in the past. Because of the drainage difficulties, the areas are unlikely to have been completely cleared for sowing but they have been cut to provide firewood and perhaps for lumber.

In many of these woodlots, several very large trees (60-100 cm in diameter) occur in a matrix of small trees (10-20 cm diameter). In many cases, these large trees indicate an old fence row suggesting that the woodlot has grown up on once-cleared agricultural land. These woodlots may date from the mid-30's or late-40's, when small scale farmsteads declined. Much of the tree development has taken place in the last 40 years or so, but forest conditions have been established in few of the woodlots. Particularly in the smaller areas (2 ha or less), most of the habitat present is of the "edge" type and the woodlots have little purely biological value, since edge habitat is most significant in combination with forest interior. The larger areas have greater potential but in many instances those woodlots

are divided among landowners, and cart tracks and wire fences have disrupted potential development of forest interior conditions. As a result, the mosaic of woodlots and agricultural fields is of only very local value. The conditions are duplicated on nearly all the adjacent concession lots throughout the Region.

Although no thorough study was made, the wildlife would appear to be common rural and forest edge species who tolerate nearby urban areas ("urbanized" species). All sites showed signs of use. The common grackle is probably the most abundant bird and the raccoon is likely the most abundant animal. Deer also are prevalent.

Ditches and channelized creeks that exhibit no base flow occur on all sites. The few natural drainage courses also do not support permanent flow; thus, aquatic habitat capabilities are very low.

4.2 Site F

The local topography on and adjacent to the site is considerable, the difference between ridges and ravine bottoms exceeding 50 m in some places. The substrate over most of the site is a poorly drained shale with low permeability. This results in droughty conditions on the ridges and upper slopes and linear wetlands or riparian (stream bank) communities in the ravines and hollows. The mosaic of vegetation communities is more complex than on any of the other sites. The severe topographic conditions and the infertility of the thin soil over the red shale of this site means that agriculture has occurred only on the northern portion, and south and east sides of the site. It appears certain that the wooded portion was logged. An area on the west side of the site was cleared for the excavation of shale during the mid- to late-'40's (Proctor and Redfern, 1982).

Of significance is the fact that this site has the largest area of wooded lands of any of the candidate landfill sites, the largest number of community types, and the largest number of rare plant species (at a provincial

level; Argus and White, 1977, 1982, 1983, 1984) in the woodlots of the candidate landfill sites (see Table 2 and Appendix A).

The site shows a greater diversity of communities, and a greater number of provincially rare plants than the portion of ESA No. 4, Sassafras Woods, that is adjacent to the north and west. It is, however, much more disturbed, which reduces its potential to be classified as an ESA.

There is one permanently flowing tributary of Indian Creek in the base of the eastern-most ravine, the water quality of which is very poor. Thus, aquatic habitat capabilities are very low.

4.3 Comparisons

A summary tabulation of the plant species identified in each of the woodlots investigated (Table 2) reveals that the number of species per woodlot ranged from 65 (D3) to 183 (F1) while the total number of species from all sites was 368. Woodlot F1 had just under 50% of all the species listed (in Appendix A) while most of the woodlots has 25%-35% of the total encountered.

The species numbers are presented by plant life form (i.e., trees, shrubs, ferns, graminoids and forbs; see Appendix A) and by point of origin (i.e., native vs. exotic; see Appendix A) to facilitate assessment of significant features. The average number of species per woodlot is 109. The low number (65) in woodlot D3 may reflect the relative homogeneity of habitat in its communities. The high number of species (183) in F1 reflects both its size and the variety of habitats found at this site. Woodlot E1 with the second highest number (149) also had a large range of habitats, most of them in wetlands. Moreover, this woodlot (E1) supports greater numbers of conifers (numerous mature white pine) than the other woodlots on the primarily agricultural sites (A, B, C, D woodlots, and E2).

The proportion of exotic (non-native, introduced) species in a given area can often be taken as measure of the history or extent of disturbance

TABLE 2

Analysis of the plant species checklist for woodlots on candidate landfill sites in the Regional Municipality of Halton. Number of species by life form and point of origin.

		B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Mean	Total Listed
Trees	Native	13	18	9	11	15	16	14	7	20	16	19	15	14	32
	Exotic	3	1	3	2	-	-	3	-	1	2	3	2	2	8
	Sub-total	16	19	12	13	15	16	17	7	21	18	22	17	16	40
Shrubs	Native	11	14	8	8	17	9	13	4	21	12	21	21	13	38
	Exotic	2	2	1	1	3	2	1	1	1	-	3	2	2	8
	Sub-total	13	16	9	9	20	11	14	5	22	12	24	23	15	46
Ferns & Allies	Native	3	6	-	1	4	1	1	3	6	-	1	5	3	11
	Exotic	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sub-total	3	6	-	1	4	1	1	3	6	-	1	5	3	11
Graminoids	Native	12	25	6	11	9	28	15	20	34	21	26	15	18	71
	Exotic	2	2	-	3	1	4	5	2	4	2	9	2	3	14
	Sub-total	14	27	6	14	10	32	20	22	38	23	25	17	21	85
Forbs	Native	24	41	24	19	45	41	41	21	48	22	63	49	36	127
	Exotic	7	6	30	21	11	19	22	7	20	19	38	13	18	59
	Sub-total	31	47	54	40	56	60	63	28	68	41	101	62	54	186
GRAND TOTALS	Native	63	104	47	50	90	95	84	55	129	72	130	105	85	279
	Exotic	14	11	34	27	15	25	31	10	20	23	53	19	24	89
	Total	77	115	81	77	105	120	115	65	149	94	183	124	109	368
	% Exotic	18	10	42	35	14	21	27	15	13	24	29	15	22	24
Rare Species		-	-	-	-	-	-	-	-	-	-	3	1	-	-

(Kaiser, 1983). The long settlement history of the Region has permitted many species that were planted for landscaping and for agriculture to establish themselves in the woodlots. The average percentage of exotics per woodlot is 22%. Woodlot B2 has an unusually low exotic component (10%) despite a distinct fence line which bisects the woodlot. Woodlot B3 has the highest incidence of exotic plant species (43 exotics) of all of the woodlots investigated. As shown in Table 2, C1, F1, D2, and E2 also have more than the average percentage of exotics.

Taking all of the above observations concerning number of species and cover type present, percentage of exotics, etc. into consideration, the following relative ranking of the biological values of the woodlots on the sites (natural biophysical communities) is suggested:

Lowest ---------- Highest

B3, C1 < B1, D2, D3 < B2, C3, D1, E2 < E1 < F1

The order of a particular woodlot in a given group is strictly alpha-numeric. For example, clear distinctions between woodlots B1, D2, and D3 cannot be made. On the other hand, the values of these three woodlots are much higher than those of B3 and C1. Woodlot A1 has not been included in this discussion since it was not closely examined. However, observations from a distance and its small area suggest that it would be placed in the group with B1, D2, and D3.

In summary, the final Site Plan Areas result in only some of the woodlots being on potential landfill sites, as follows:

Not On A Site Plan Area - A1, B1, C1, C2, D3, E1, most of C3, most of E2.

The remaining communities are situated on a Site Plan Area, as follows:

On A Site Plan Area - B2, B3, C4, D1, D2, F1, northwest portion of C3, south portion of E2.

The Natural Resources Evaluation Charts which detail the expected impacts, and the significance of those impacts of a landfill being located on a Site Plan Area. Summarizing the last column of the Charts, the following ratings are noted:

Site Plan Area A received one "Low" rating.
Site Plan Area B received four "Low" ratings.
Site Plan Area C received one "Low" rating.
Site Plan Area D received one "Low" rating.
Site Plan Area E received three "Low" ratings.
Site Plan Area F received three "Low" ratings,
one "Moderate" rating, and
one "Positive" impact.

Site Plan Areas A, C, and D offer the least biological constraints to the location of a landfill. The constraint on Site A relates to future potential downstream water quality deterioration; however, the possibility also exists for control of the sedimentation that now occurs. The constraint on both Site C and D relates to the loss of woodlot communities that have some biological value in terms of species present, etc. (see above discussion concerning relative ranking of the woodlots). A landfill on Site C would result in the partial loss of woodlot C3, and almost total loss of D1. D2 would also be eliminated; however, it is very small and isolated, and has a low biological significance.

Site Plan Areas B and E are somewhat less suitable. On Site B, the most significant of the constraints relates to the loss of woodlot B2 which has the potential to provide wildlife habitat, and is the least disturbed woodlot investigated in terms of the percentage of exotics in its flora. On Site E, there is the potential of habitat for and the presence of the West Virginia White Butterfly. However, the portion of woodlot E2 that woud be eliminated is small and supports a low diversity of cover types (compared with the rest of E2).

Site Plan Area F, with the presence of rare plants and the diversity of community types, is the least suitable site for a landfill, from the perspective of the biophysical sub-factors and measures. This rating is only valid if an extractive operation (shale quarry) does not occur on the site. That activity would substantially lower the biophysical significance of the site.

Considering biophysical characteristics, the ratings presented in the Charts, and the above discussion, the Site Plan Areas can be listed in order of relative suitability to support a landfill operation:

More suitable ---------- Less suitable

A > D > C > B, E > F

This priority listing may be considered a "preference" list from the biological perspective. However, it must be stressed that the differences among Sites D, C, B, and E, are not major. Thus, in summary, the Site Plan Areas can categorized as follows:

- No real biophysical constraint to a landfill site exists - A;
- Some constraints exist, but are not eliminatory - B, C, D, E; and
- Significant constraints exist - F.

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA A

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	-	-	-	-	-	-	0
b) Important	-	-	-	-	-	-	0
c) Managed	-	-	-	-	-	-	0
PLANT SPECIES							
a) Rare	-	-	-	-	-	-	0
WILDLIFE HABITAT							
a) Habitat	-	-	-	-	-	-	0
b) Corridor	-	Some animals may be disrupted in movement but site is not well situated as a corridor.	nil - not significant as a movement corridor.	-	as stated.	nil	0
AQUATIC SYSTEMS							
a) Pattern	Not well developed	Overland and channelized flow would be managed.	nil	-	as stated.	nil	0
b) Water Characteristics	Heavy sediment load in channels after storm.	Increase in downstream suspended and dissolved load.	low - low/no flow characteristics	Standard site engineering/storm water management.	Potential remains for impacts on downstream conditions; however, there is the possibility that downstream water quality could be improved.	low	1

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA B

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	-	-	-	-	-	-	0
b) Important	-	Loss of woodlots.	Central woodlot (B2) is good size and may be important for local wildlife.	Structurally diverse vegetation should be planted in buffer area.	Planted vegetation may not be as suitable for animals.	low - vegetation community would be re-established.	L
c) Managed	-	Potential for management of B2 woodlot is lost.	low - potential that it would be managed is low, as there is more than one owner.	-	as stated.	low	L
PLANT SPECIES							
a) Rare	-	-	-	-	-	-	0
WILDLIFE HABITAT							
a) Habitat	-	-	-	-	-	-	-
b) Corridor	-	Loss of movement corridor along Morrison Creek channel.	low - animals would remain to north in vicinity of East 16 Mile Cr.	Buffer system along one side of site could be developed to provide movement corridor.	Species would have to adapt to new environment which may not be as suitable.	low	L
AQUATIC SYSTEMS							
a) Pattern	Headwater tributary of Morrison Creek has intermittent flow.	Drainage pattern would have to be	nil - channel only carries storm flow;	-	as stated.	nil	0
b) Water Characteristics	-	Increase in downstream suspended and dissolved load.	low - low/no flow characteristics reduce potential for adversely affecting Creek downstream.	Standard site engineering/storm water management.	Potential remains for impact on downstream conditions.	low	L

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA C

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	-	-	-	-	-	-	0
b) Important	-	Loss of a portion of woodlot (C3). that has a relatively high biological value (low level of disturbance).	low - only a portion of woodlot will be lost.	-	as stated.	low	L
c) Managed	-	Potential for management is lost	nil - very doubtful that lost portions would ever be managed.	-	-	-	0
PLANT SPECIES							
a) Rare	-	-	-	-	-	-	0
WILDLIFE HABITAT							
a) Habitat	-	-	-	-	-	-	0
b) Corridor	Movement corridor is to east, along creek channels.	-	-	-	-	-	0
AQUATIC SYSTEMS							
a) Pattern	Site is to west of main channel development.	-	-	-	-	-	0
b) Water Characteristics	-	-	-	-	-	-	0

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA D

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	-	-	-	-	-	-	0
b) Important	-	Loss of D1 woodlot and most of D2 woodlot.	low - woodlot D1 is very small and D2 is very disturbed and fragmented.	-	as stated.	low	L
c) Managed	-	Potential for management is lost.	nil - D1 is too small to manage and D2 is not physically suitable.	-	-	-	0
PLANT SPECIES							
a) Rare	-	-	-	-	-	-	0
WILDLIFE HABITAT							
a) Habitat	-	-	-	-	-	-	0
b) Corridor	-	Some animals may be disrupted in movement but site is not well situated as a corridor.	nil - not significant as a movement corridor.	-	as stated.	-	0
AQUATIC SYSTEMS							
a) Pattern	-	-	-	-	-	-	0
b) Water Characteristics	-	-	-	-	-	-	0

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA E

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	-	-	-	-	-	-	0
b) Important	-	Small portion of southern end of northern woodlot (E2) would be cleared.	low - only a small portion lost.	-	as stated.	low	L
c) Managed	-	Area to be lost is too small to manage	nil	-	-	-	0
PLANT SPECIES							
a) Rare	-	-	-	-	-	-	0
WILDLIFE HABITAT							
a) Habitat	Unconfirmed sighting of West Virginia White Butterfly.	Potential loss of habitat.	low - required components of habitat were not noted during field work and area to be disturbed has doubtful potential in this respect.	-	as stated.	low - further investigation of site may be required if site chosen.	L
b) Corridor	Situated between relatively natural areas to the north and south although Derry Road is increasingly becoming a barrier to movement.	Barrier to movement may be established.	low - animals would probably be displaced to the west.	-	as stated.	low	L
AQUATIC SYSTEMS							
a) Pattern	-	-	-	-	-	-	0
b) Water Characteristics	-	-	-	-	-	-	0

BIOPHYSICAL EVALUATION CHART - SITE PLAN AREA F

Evaluation Sub-factors & Measures	Prevailing Condition &/or Anticipated Change	Potential Impact From Landfill	Significance of Impact	Mitigating Measures	Residual Impact	Significance of Residual Impact	Rating
COMMUNITY							
a) Uncommon	A very wide range of community types within a small geographic area. Typical carolinian conditions occur in some areas; extensive disturbance in other area. Existing designations on land (extractive licence) may cause changes that would that would reduce adverse rating of site for landfill.	Complete loss.	moderate - loss of wide range of community types not well represented elsewhere in Region	-	as stated.	moderate	M
b) Important	-	Loss of woodlots which provide wildlife habitat.	low - main function of area is not wildlife habitat	-	as stated.	low	L
c) Managed	-	Potential for management is lost	low - no indication that owners plan to manage area (would conflict with maintenance of "uncommon" conditions)	-	as stated.	low	L
PLANT SPECIES							
a) Rare	At least three provincially rare species present (see note under "uncom-com").	Complete loss.	high - ideally situated for growth of rare species.	-	as stated.	high	H
WILDLIFE HABITAT							
a) Habitat	-	-	-	-	-	-	0
b) Corridor	Site is not well situated as a movement corridor.	-	-	-	-	-	0
AQUATIC SYSTEMS				•			
a) Pattern	Only one creek has permanant flow.	Headwater tributaries of Indian Creek would be disrupted.	low - creek flow pattern would be modified.	-	as stated.	low	L
b) Water Characteristics	Water quality in permanent creek is very poor (fed by spring from former Bayview Landfill site).	Improvement in downstream water quality would occur because of management system introduced for landfill.	Positive improvement	-	-	positive improvement.	+++

APPENDIX A

List of Plant Species

List of plant species in 12 woodlots occurring on or adjacent to candidate landfill sites in the Regional Municipality of Halton. Species are only those identified in the course of this June 1984 study and do not include records available elsewhere (e.g. Proctor & Redfern 1982).

Species names follow the Flora of Canada by H.J. Scoggan (National Museums of Canada, 1979; 1980). The column on the extreme right indicates the point of origin of the listed species as native (N) or exotic (A).

The designation of woodlots follows that of Table 1. In the case of woodlot F1 distinction has been made between 3 vegetation communities: R = riparian; S = shrubland; X = forest. For all other woodlots, X denotes the occurrence of a given species in the survey area without assignment to a particular community.

On the extreme left "C" indicates that a specimen was collected for laboratory examination and identification and "r" indicates a provincially rare species as reported by Argus & White (1977; 1982; 1983).

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
TREES														
Acer														
negundo				X				X						A
rubrum		X	X			X	X			X	X	X	X	N
saccharinum		X	X			X	X	X		X	X			N
saccharum		X	X		X	X				X		X	X	N
Betula														
lutea										X				N
papyrifera			X							X	X			N
Carpinus														
caroliniana		X	X	X		X	X			X		X		N
Carya														
cordiformis		X												N
ovata		X	X	X		X	X	X	X	X	X	X	X	N
Crataegus sp.			X	X		X		X			X	X		
corusca								X						N
macracantha					X									N
C monogyna		X								X	X			A
pedicellata							X	X				X		N
punctata					X		X			X				N
Fagus														
grandifolia		X	X	X	X	X	X			X	X			N
Fraxinus														
americana		X	X		X	X	X			X	X		X	N
pennsylvanica			X		X		X	X	X	X	X	X	X	N
Ostrya														
virginiana		X	X	X		X	X	X	X	X	X	X	X	N
Pinus														
strobus		X	X	X		X	X		X	X	X	X	X	N
Picea														
abies				X										A
glauca												X		N
Populus														
balsamifera											X			N
deltoides												X		N
grandidentata										X		X	X	N
tremuloides			X					X		X	X		X	N
Prunus														
avium		X	X	X									X	A
serotina		X	X	X	X	X						X	X	N
Pyrus														
communis					X						X	S		A
malus		X			X							X	X	A
Quercus														
alba						X	X	X		X	X	X	X	N
macrocarpa			X		X		X	X	X	X	X	S		N
rubra		X	X	X	X	X	X	X	X	X		X	X	N
velutina													X	N
Robinia														
pseudo-acacia												X	X	N
Salix														
alba								X				R		A
amygdaloides								X				X		N
fragilis								X						A

	Woodlot B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Tilia americana	X	X		X	X	X	X	X	X	X		X	N
Ulmus americana		X	X	X	X	X	X		X	X	X		N
SMALL TREES, SHRUBS and VINES													
Amelanchier arborea	X	X			X		X	X	X		X		N
laevis					X							X	N
sanguinea				X			X					X	N
Berberis thunbergii								X					A
Ceanothus americanus											X	X	N
Cephalanthus occidentalis		X			X				X				N
Cornus racemosa	X	X		X	X	X	X	X	X	X	S/R	X	N
rugosa										X	X	X	N
stolonifera									X	X			N
Diervilla lonicera												X	N
Hamamelis virginiana											X	X	N
Ilex verticillata		X		X	X				X				N
Lonicera dioica					X		X		X			X	N
morrowii		X				X							A
tatarica	X	X	X	X	X	X					X		A
Parthenocissus inserta			X		X		X		X	X	R	X	N
Philadelphus coronarius												X	A
Prunus nigra							X						N
virginiana	X	X	X	X	X	X	X		X	X	X	X	N
Rhamnus cathartica					X						X		A
Rhus aromatica											X		N
radicans	X	X			X	X	X		X	X	S/W	X	N
typhina					X						S	X	N
Ribes americanum		X	X										N
cynosbati	X	X	X		X		X	X	X		X	X	N
sativum	X				X		X		X				A

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
	Rosa													
	blanda					X						S	X	N
	eglanteria											S/W		A
	palustris									X				N
	Rubus													
	allegheniensis	X	X		X	X						X		N
	idaeus	X	X	X	X	X	X	X			X	S/W	X	N
	occidentalis	X	X	X	X		X	X		X	X		X	N
	Salix													
	discolor						X				X			N
	eriocephala		X				X					X		N
	petiolaris						X			X	X			N
	Sambucus													
	canadensis	X								X				N
	pubens	X		X									X	N
	Spiraea													
	alba					X		X		X				N
	Syringa													
	vulgaris												X	A
	Vaccinium													
C	angustifolium									X		X	X	N
C	corymbosum									X				N
	pallidum											X		N
	Viburnum													
	acerifolium		X			X				X		X	X	N
	lentago					X				X	X	X		N
	rafinesquianum							X	X	X		X	X	N
	Vitis													
	riparia	X	X	X	X		X			X	X	R/W	X	N
	FERNS and ALLIES													
	Ricciocarpus (an aquatic													
C	natans liverwort)							X		X				N
	Athyrium													
	felix-femina	X	X			X	X		X				X	N
	Botrychium													
	virginianum												X	N
	Dryopteris													
	cristata					X								N
	spinulosa	X	X		X	X			X				X	N
	Equisetum													
	arvense		X							X		R/W	X	N
	sylvaticum									X				N
	Matteuccia													
	struthiopteris									X				N
	Onoclea													
	sensibilis	X	X			X				X			X	N
	Polystichum													
	acrostichoides		X						X					N
	Thelypteris													
	palustris		X							X				N

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
	GRAMINOIDS													
	Agropyron													
	repens											S		A
	Agrostis													
	gigantea											S		A
	stolonifera			X				X	X	X	X	R		N
	Alopecurus													
	pratensis						X	X	X					A
	Bromus													
C	commutatus	X												A
	inermis					X	X	X		X	X	S/R	X	A
C	japonicus											S		A
C	pubescens											X		N
	Calamagrostis													
	canadensis					X				X				N
	Carex													
	albursina		X				X						X	N
C	alopecoidea						X	X			X	R		N
C	amphibola										X			N
	arctata		X				X			X				N
C	aurea									X				N
	bebbii		X											N
C	blanda		X				X		X	X	X			N
C	brunnescens									X				N
	canescens									X				N
C	cephaloidea								X			X		N
C	cephalophora											X		N
	communis											X		N
	convoluta		X		X							X	X	N
	crinita		X			X	X							N
C	cristatella	X		X			X	X	X	X	X	R		N
	deweyana						X					X		N
r	gracilescens											X		N
	gracillima	X	X				X	X		X	X			N
	granularis											X		N
C	grayi										X			N
C	hirtifolia						X		X					N
	intumescens		X			X			X					N
	lacustris									X				N
C	laxiculmis		X					X	X					N
C	leptonervia											X		
	lupulina	X				X	X		X		X			N
C	molesta		X							X	X			N
C	muricata												X	A
	pensylvanica	X	X		X					X		X	X	N
	platyphylla											X	X	N
C	projecta	X								X				N
	pseudo-cyperus									X				N
	rosea	X	X			X	X			X	X		X	N
	retrorsa							X			X		X	N

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
C	scoparia		X				X			X				N
	sparganioides						X	X	X	X	X			N
C	spicata		X		X			X		X	X			A
C	tenera	X	X				X			X	X			N
	tribuloides	X	X				X			X				N
	tuckermanii		X			X					X			N
	vulpinoidea		X	X	X		X	X	X	X	X	R		N
C	woodii						X		X					N
	Dactylis													
	glomerata		X		X		X	X	X			S		A
	Danthonia													
	spicata						X						X	N
	Eleocharis													
	acicularis						X							N
	erythropoda										X	R		N
	obtusa						X	X			X			N
	Elymus													
	virginicus								X					N
	Festuca													
	obtusa											X	X	N
	pratensis											S		A
	rubra											X		A
	Glyceria													
C	maxima									X				A
C	septentrionalis		X						X					N
	striata	X	X	X	X		X	X	X	X	X	X	X	N
	Hordeum													
	jubatum											S		A
	Hystrix													
	patula								X			X		N
	Juncus													
	bufonius									X				N
	dudleyi											R		N
	effusus	X	X	X	X		X		X	X	X			N
	tenuis	X		X	X		X	X			X		X	N
	Leersia													
	oryzoides				X		X	X				R		N
	virginica								X					N
	Luzula													
	acuminata		X				X		X	X			X	N
C	multiflora											X	X	N
	Oryzopsis													
	asperifolia									X				N
	Phalaris													
	arundinacea				X					X				N
	Phleum													
	pratense				X	X	X	X		X	X	S		N

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
	Poa													
	compressa	X	X		X	X		X		X	X		X	N
C	palustris						X							N
	pratensis	X			X		X	X		X		S		A
	Scirpus													
	atrovirens		X		X		X		X	X	X	R		N
	cyperinus									X				N
	validus									X				N
	Sparganium													
	eurycarpum		X							X				N
	Sphenopholis													
C	intermedia							X	X	X	X		X	N
rC	nitida											X	X	N
	Typha													
	latifolia		X			X				X	X	R		N
	FORBS													
	Achillea													
	millefolium					X	X	X		X		S		A
	Actaea													
	pachypoda		X			X							X	N
	rubra								X	X				N
	Agrimonia													
	gryposepala		X				X	X						N
	Alisma													
	plantago-aquatica		X				X	X		X		R		N
	Alliaria													
	petiolata							X				X	X	A
	Allium													
	tricoccum						X		X					N
	Ambrosia													
	artemisiifolia			X				X				S		N
	Amphicarpa													
	bracteata											X	X	N
	Anemone													
	canadensis												X	N
	quinquefolia		X		X	X						X	X	N
	virginiana											X	X	N
	Anemonella													
C	thalictroides											X	X	N
	Antennaria													
	neglecta				X								X	N
	plantaginifolia							X				X		N
	Apocynum													
	androsaemifolium	X			X					X		X		N
	Arabis													
	canadensis											X		N
	Aralia													
	nudicaulis			X		X								N

Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Arctium													
lappa			X	X		X					S		A
minus			X	X	X	X	X		X	X			A
Arisaema													
triphyllum	X	X			X	X						X	N
Asarum													
canadense												X	N
Asclepias													
incarnata										X			N
syriaca			X	X									N
Asparagus													
officinalis				X							S		N
Aster													
cordifolius				X	X	X	X				X	X	N
ericoides											S		N
laevis											X	X	N
lateriflorus							X	X	X		X	X	N
macrophyllus	X	X			X			X	X		X		N
novae-angliae				X		X	X		X		S		N
puniceus			X			X				X			N
sagittifolius											X		N
simplex	X		X			X		X	X	X	S		N
Barbarea													
vulgaris			X	X		X	X				R		A
Bidens													
cernua									X				N
frondosa	X						X		X		R		N
Boehmeria													
cylindrica												X	N
Brassica													
kaber				X							X		A
Capsella													
bursa-pastoris			X										A
Caulophyllum													
thalictroides					X								N
Cerastium													
vulgatum									X				A
Chenopodium													
album			X			X	X						A
Chrysanthemum													
leucanthemum			X	X	X	X	X		X	X	S/X	X	A
Cichorium													
intybus											X		A
Circaea													
quadrisulcata	X	X	X		X	X	X	X	X	X	X	X	N
Cirsium													
arvense			X	X			X				S		A
vulgare			X	X					X		S		A
Comandra													
umbellata											X		N
Convolvulus													
arvensis											S		A

	Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Cryptotaenia canadensis												X		N
Cynoglossum officinale					X									A
Daucus carota		X			X		X	X			X	S		A
Desmodium glutinosum						X							X	N
Desmodium paniculatum													X	N
Dianthus armeria								X	X		X	S	X	A
Dipsacus fullonum			X	X	X	X	X	X	X	X	X	S	X	A
Echinocystis lobata		X		X	X	X	X	X			X	X		N
Echium vulgare												S		A
Epifagus virginiana			X											N
Epilobium ciliatum												R		N
Epipactus helleborine		X	X	X		X		X	X	X	X	X	X	A
Erigeron annuus				X				X					X	N
Erigeron philadelphicus				X		X					X	X		N
Erigeron strigosus			X	X	X							X		N
Erysimum cheiranthoides				X						X				A
Erythronium americanum			X			X				X				N
Euonymus obovatus			X			X	X	X		X		X		N
Eupatorium maculatum					X	X	X	X		X		R		N
Eupatorium perfoliatum										X		R		N
Fragaria vesca		X	X		X		X	X	X	X	X	S	X	N
Fragaria virginiana			X	X		X	X	X	X	X	X		X	N
Galium aparine					X	X				X	X	X	X	N
C Galium circaezans												X		N
Galium lanceolatum					X	X							X	N
Galium palustre			X				X			X	X			N
Galium triflorum		X				X				X		X	X	N
Geranium maculatum		X	X			X	X	X	X		X	X		N
Geranium robertianum		X	X	X			X		X	X		X	X	N
Geum aleppicum		X	X	X	X	X	X		X	X	X	R		N
Geum canadense		X	X	X		X	X	X		X	X	X	X	N
Geum laciniatum				X			X	X			X	X		N
C Geum urbanum		X												A

	Woodlot B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Hepatica americana		X			X						X	X	N
Helianthus divaricatus											X		N
Hieracium aurantiacum				X						X			A
florintinum					X				X	X			A
pilosella											X		A
pratense	X		X	X		X			X	X	X	X	A
Hydrophyllum virginianum					X	X		X					N
Hypericum perforatum			X	X	X					X	S	X	A
Impatiens capensis	X	X		X	X	X	X		X			X	N
Inula helenium			X	X		X	X	X		X	S		A
Lapsana communis												X	A
Lemna minor		X				X	X		X				N
trisulca									X				N
Leonurus cardiaca			X	X			X						A
Lepidium campestre											S		A
Lespedza hirta												X	N
Lilium michiganense					X		X						N
Linaria vulgaris											S		A
Lobelia inflata							X						N
Lotus corniculatus							X						A
Lycopus americanus				X		X	X		X	X	R		N
uniflorus			X			X			X				N
Lysimachia ciliata			X	X		X	X						N
Lythrum salicaria									X	X			A
Maianthemum canadense	X	X			X				X		X	X	N
Medicago lupulina			X	X			X		X	X	S/X		A
Melilotus alba						X	X				S		A
officinalis											S/X		A
Mentha arvensis			X				X						N

Woodlot	B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Mimulus ringens								X		X			N
Monarda fistulosa											X		N
Monotropa hypopithys												X	N
Myosotis laxa		X											N
Nepeta cataria			X	X									A
Oenothera parviflora											S		N
Osmorhiza claytonii					X								N
Oxalis europaea			X				X		X				A
Penthorum sedoides							X						N
Pernanthes sp.		X			X								N
Phlox divaricata						X							N
Pilea pumila												X	N
Plantago major			X							X	S		A
Plantago rugelii						X	X		X		S	X	N
Podophyllum peltatum	X	X	X		X	X	X	X	X	X	X	X	N
Polygala paucifolia		X			X								N
Polygonatum pubescens	X	X			X		X		X			X	N
Polygonum achoreum											R		A
Polygonum convolvulus			X										A
Polygonum hydropiperoides							X						N
Potamogeton cf. natans						X	X		X				N
Potamogeton cf. pectinatus						X			X				N
Potentilla recta		X	X	X		X	X		X	X	S		A
Potentilla simplex	X	X			X	X			X		X	X	N
Prunella vulgaris	X	X	X		X	X	X	X	X	X	X	X	N
Pyrola elliptica		X											N
Ranunculus abortivus		X	X		X	X	X	X	X		X	X	N
Ranunculus acris		X	X		X	X	X		X		X	X	A
Ranunculus hispidus											X	X	N
Ranunculus scleratus						X					S	X	N

	Woodlot	B1	B2	B3	C1	C3	D1	D2	U3	E1	E2	F1	F2	Origin
	Rumex acetosella			X									X	A
	crispus						X							A
	Sanguinaria canadensis												X	N
	Sanicula gregaria							X						N
C	marilandica	X				X	X	X		X	X	X		N
C	Saxifraga virginiensis											X	X	N
	Scutellaria galericulata		X											N
	Senecio vulgaris			X										A
	Sium suave		X			X				X				N
	Smilacina racemosa		X	X		X	X	X	X	X		X	X	N
	Smilax herbacea					X		X		X		X	X	N
	Solanum dulcamara	X	X	X			X	X	X	X		R		A
	Solidago altissima	X	X	X	X	X	X	X		X	X	S		N
	bicolor											X	X	N
	caesia	X	X							X		X	X	N
	canadensis		X			X					X			N
	flexicaulis		X			X							X	N
	gigantea									X				N
	juncea											X	X	N
	Sonchus arvensis			X										A
	Stellaria graminea			X			X		X	X	X	R		A
	Swertia caroliniensis											X		N
r	Taraxacum officinale	X	X	X	X	X	X	X		X	X	S	X	A
	Thalictrum dioicum		X			X						X	X	N
	polygamum									X				N
	Tovara virginiana								X					N
	Trifolium hybridum			X	X							S		A
	pratense									X		S		A
	Trillium erectum		X							X				N
	grandiflorum	X	X	X		X			X	X			X	N
	Urtica dioica						X							N
	Uvularia grandiflora												X	N

	Woodlot B1	B2	B3	C1	C3	D1	D2	D3	E1	E2	F1	F2	Origin
Verbascum thapsus			X								X		A
Verbena hastata		X		X			X	X					N
Veronica officinalis	X	X			X	X		X	X	X	X	X	A
perigrina		X											A
serpylifolia							X						N
Vicia cracca				X	X	X	X			X	S		A
tetrasperma											S/R	X	A
villosa											S		A
Viola canadensis						X			X				N
pubescens		X			X	X	X			X	X		N
sororia		X									X		N
Waldsteinia fragarioides	X	X				X		X	X				N

APPENDIX B

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